Executive Summary - Fort Worth Floodway Periodic Inspection #10 Results

Public safety is the No. 1 priority of the U.S. Army Corps of Engineers' (USACE) Levee Safety Program. USACE conducts continuous and periodic inspections of 2,000 levee systems comprising 14,000 miles of levees nationwide. The purpose of these inspections is to verify the proper operation and maintenance; evaluate operational adequacy and structural stability; identify features to monitor over time; and improve the ability of USACE and the non-Federal Sponsor to communicate the overall condition of the floodway to all project stakeholders. Many of these floodways, like the Fort Worth Floodway, are comprised of levees that were initially constructed by local community interests in response to flooding events in the early 1900s and were subsequently expanded and/or augmented by the USACE to implement Congressionally authorized flood protection.

In 2008, the USACE implemented a new inspection process, based upon a new national policy guidance letter, which tightened the standards and changed the assessment methodology. This new process better identifies nonconforming components that potentially could compromise the integrity and viability of levees by using a systems approach that incorporates risk-based concepts with a focus on sustainability. Nonconforming components are identified during the periodic inspection for further engineering review and studies to determine if they may or may not induce unacceptable risk. After thorough evaluation of field observations, historical data and system performance history, the USACE assigns system ratings that reflect their qualitative assessment of potential risks to the public, property and the environment. The USACE also recommends further engineering analysis to address the nonconforming components where appropriate to reduce uncertainties that may be significantly influencing perceived risks. These may result in repair or remediation actions that would help to minimize those risks.

On Nov. 1-5, 2010, a USACE team from the Fort Worth District performed a regular, periodic inspection of the Fort Worth Floodway using the new inspection template. Such inspections, conducted every five years, are more thorough than annual inspections. (The last periodic inspection was in December 2005.) Although this is the Fort Worth Floodway's 10^{th} periodic inspection, it is the first one conducted under the more rigorous inspection methodology that involves engineering review of the potential effects of nonconforming components on the system's performance during a major flood event (floodwater that reaches the design flood height of the levee). Since the completion of the Federal channel improvements by the USACE in the 1950s, no flood event has ever risen significantly out of the channel banks, let alone reach the design flood height. In addition, this inspection did not identify conditions that would impact performance of the Fort Worth Floodway levee systems during the passage of the current FEMA Base Flood (commonly referred to as the 100-year flood). Overall the system remains operational and safe to pass a moderate flood . Completing any necessary identified corrective actions will reduce the overall risk for passing a major/extreme flood.

This new nationwide Levee Inspection System protocol is more thorough than earlier inspections. Instead of driving by the levee and noting potential problems, multi-disciplinary teams walked the 22.1 miles of levees in the Fort Worth Floodway. One team focused on the earthen embankments and another team conducted inspections of all floodway structures. For the first time, the levee inspectors carried with them a more thorough 15-category standardized checklist used for all levee inspections nationwide.

Inspectors rated each individual system component on such criteria as unwanted vegetation growth, sod cover, encroachments, closure structure condition, slope stability, erosion/bank caving, levee settling, ponding, cracking, animal burrowing and the condition of culverts/pipes, embankment structures such as riprap and blocks, seepage and relief wells/toe drains, etc. Individual component ratings are assigned as either Acceptable, Minimally Acceptable or Unacceptable and are determined based on the guidelines in the standardized checklist. A decision is then made, based upon the information developed through implementation of this process and the engineering judgment of the multi-disciplinary inspection team, that establishes how an unacceptable component rating will affect the overall system performance.

The new USACE Levee Inspection System has three possible overall system ratings that provide a basis for determining the direction for possible future evaluation, studies and potential corrective actions. These overall ratings for each of the 13 individual systems that comprise the Fort Worth Floodway are based on the ratings assigned to components within each system as follows:

- (A) ACCEPTABLE – All system components are rated Acceptable. *(No components were identified contrary to the national policy.)*
- (M) MINIMALLY ACCEPTABLE – One or more system components are rated as Minimally Acceptable, or one or more system components are rated as Unacceptable and an engineering determination concludes that the Unacceptable component(s) would not likely prevent the system from performing as intended during a flood event to the full height of the levee. *(Minimally Acceptable recognizes that certain system components are non-compliant with the national policy; however, integrity is not compromised.)*
- (U) UNACCEPTABLE – One or more system components are rated as Unacceptable and an engineering determination concludes that the component would likely prevent the system from performing as intended during a flood event to the full height of the levee. *(Unacceptable recognizes that there are one or more system components that are nonconforming to the national guidelines which may require site specific engineering studies to determine whether or not risks are present that may require remediation using a Corrective Action Plan.)*

The Fort Worth Floodway, which supports protection of the central business district, has three river channel systems and 10 levee systems that reduce the flood risk along the West Fork and Clear Fork of the Trinity River. Portions of the levees within this floodway were constructed in 1910 by local interests as a result of flooding in 1908. Federal involvement began in the 1940s when Congress authorized flood damage reduction improvements. The existing levees were modified and lengthened and the river channel was straightened and widened to increase the floodway's capacity to convey flood waters by the USACE in response to the 1949 flood event. Upon completion of the system, USACE turned over all maintenance and operation of the Fort Worth Floodway system to the Tarrant Regional Water District (TRWD). Since that time the system has been inspected by the USACE to verify the system was being maintained in a satisfactory condition. Under the previous rating system, the TRWD never received a failing review of this system. For this periodic inspection of the Fort Worth Floodway's 13 systems, the USACE implemented the new periodic inspection process.

- The three river channel systems are rated Minimally Acceptable, primarily due to observed erosion in some areas that will require some minor correction and continued monitoring.
- Two levee systems (Carswell Levee and Sump No. 6 Levee) are rated Minimally Acceptable. Closer inspection and rehabilitation of storm drainage closures and video inspection of culverts and pipes are primary areas needing corrective action.
- The eight levee systems listed below are rated Unacceptable. The primary areas of concern on these levee systems are trees that are not in compliance with the new USACE national vegetation standard and encroachments. These include some components constructed by the USACE and others – such as pipelines, power lines and highway bridges – previously reviewed and approved by USACE and located within the system's right-of-way. Some of these encroachments are non-compliant with today's new USACE national policy and further analysis is required.

  - White Settlement Levee
  - Brookside Levee
  - Crestwood Levee
  - Clear Fork Levee Loop
  - North Main Levee Loop*
  - West Fork Levee Loop*
  - Overton Levee*
  - Watermelon Levee*

Four of the systems above (denoted by asterisks) were constructed with levee widths that exceed the minimum design requirements in some areas which may reduce the risks associated with vegetation and encroachments. TRWD is preparing an evaluation of these areas to demonstrate that there is sufficient resiliency in these levee embankments as constructed. The Fort Worth District is in support of these efforts and upon approval of the evaluation, variances may be authorized for the vegetation in these areas and their system ratings would subsequently be upgraded to Minimally Acceptable.

TRWD is a cooperative public sponsor that has a strong sense of responsibility and strong track record for maintaining the floodway in accordance with USACE regulations. In the months following the November inspection, TRWD proactively collaborated with the USACE to implement corrective action on over 165 items to improve many individual component ratings. Several of the non-conforming components contributing to the comprehensive system ratings are systemic issues that require a more in-depth evaluation and mitigation solution. TRWD and the USACE will continue their collaborative partnership to resolve the remaining issues to ensure that the operational adequacy and structural integrity of the floodway are sustained in a manner that minimizes risks to public safety.